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MOSES OF COLORADO FROM TOLLAND AND VICINITY

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For years I have had a desire to collect and study the mosses of the Rocky Mountains. The summer of 1914 gave me my opportunity at the laboratory of the Summer School of Biology of the University of Colorado at Tolland. Tolland is nearly fifty miles from Denver by the Moffat road and only about twelve or fifteen from the continental divide as the crow flies. The village of Tolland is largely a summer resort and there are numerous cottages to rent to summer dwellers. Just north of the village runs South Boulder Creek. The valley of the creek here expands into a meadow a mile or more in length and a little less than half a mile in width. This is known as "The Park." In the Park are at least two small lakes and several beaver dams. The creek is kept at high water, comparatively speaking, by the melting snows of the neighboring mountains, the snow clad summits of which are in full view from the town.

The village is at an altitude of about 9000 feet and the surrounding mountains were originally covered with a forest of lodge-pole pine, Englemann spruce and other conifers, but miners and fires have destroyed most of the trees. Moist ravines and cool, moist, north-facing slopes occur, but are not dominant. The only locality visited that would compare to the cool, moist, heavily-wooded localities of the mountains of New England and New York, localities which are most favorable for moss growth, was a deep wooded swamp in the region above Eldora Lakes.

The region about Tolland has a good deal of rainy and foggy weather in summer. We stayed through the month of July and for the last two weeks there was scarcely a day without rain. The region is one gorgeous alpine flower garden. But even here conservation needs to have a say, for great bunches of the beautiful blue and white columbine, the state flower, are brought to the trains for sale and the plants are rapidly being depleted if not altogether destroyed.

I have received much assistance from Miss H. A. Leonard, a student at the summer school, who has collected in localities I could not reach and at other seasons of the year. Dr. Ramaley, the Director of the school, placed the laboratory and its equipment at my service. Dr. Andrews, Mr. R. S. Williams, Prof. Holzinger, and Dr. Best kindly assisted me in making determinations. To each of these persons I acknowledge my indebtedness and hereby express my appreciation.

Practically no mosses here listed are from the western slope of the Rockies. A few from Corona and possibly some from Arapahoe and James peaks were a few rods over the crest.

I found the mosses more Eastern than Pacific, as the list shows. There were practically no mosses on the trunks of the trees. *Polytricha* were not numerous either in species or individuals, with the exception of *Polytrichum piliferum*, which was abundant up to 13,000 ft. To understand this and some other facts it will help to remember that this region is at about the latitude of Baltimore.

There were no mosses on the stones in the beds of the mountain creeks, with few exceptions. At first I thought this was due to the temperature, but at Corona Lake at an altitude of at least 11,000 ft. and with melting snow discharging directly into the lake, I found the stones as well covered as in New England. In one place at Tolland I found a sluggish cross creek well stocked with mosses, including *Fontinalis antipyretica*, the only species of the genus and the only locality discovered. I believe that the swiftness of the streams, filled all summer, with no low water in warm weather, accounts for the lack of mosses in the beds of the streams. Not a single species of *Fissidens* was found. *Hypnum revolutum* is the dominant species in the forests, replacing our eastern forms, such as *crista-castrensis*, *imponens*, etc. This moss is polymorphous and apparently abundant all through the high mountains of Colorado, as it has been sent me in a great variety of forms from other localities, particularly Pike's Peak. *Drepanocladus* species are very abundant in the swamps.

I was particularly pleased to find *Brachythecium Nelsoni* Grout abundant and well marked and almost supplanting *B. rivulare*. *Sphagnum* is found in the region but it is very scarce. I collected none because I saw none.

POLYTRICHACEAE

Catharinea Selwyni (Aust.) E. G. B. Moist north-facing slope one mile below Tolland. Alt. about 8,800 ft. Sterile.

Pogonatum alpinum brevifolium Brid. Summit of James Peak, 13,000 ft. Collected by Miss Leonard. The short oblique unsymmetric capsule does not at all suggest this species, neither does the habit or appearance of the plant. But for Prof. Frye's excellent monograph on our Western *Polytrichaceae* I should never have been able to place these specimens.

Polytrichum gracile Dicks. Not infrequent and fruiting freely.

P. juniperinum Willd. Soil near Tolland. Miss Leonard. A stunted form from the side of Arapahoe Peak may be var. *alpinum*.

P. piliferum Schreb. Common and extending up to 13,000 ft. on James Peak.

DICRANACEAE

Ceratodon purpureus (L.) Brid. Common on bare and barren soil and around rocks.

Dicranodontium longirostre (W. & M.) B. & S. Near trestle above Tolland.

Dicranoweisia cirrhata (L.) Lindb. Common on and around ledges.

Dicranum Bonjeani DeNot. Frequent in moist situations and often approaching *D. scoparium*.

D. rhabdocarpum Sulliv. (Det. R. S. Williams). Moist north-facing slope one mile below Tolland. There were brood bodies along the upper surface of the costa.

D. brevifolium Lindb. ("Probably"—R. S. Williams.) Corona, Alt. 11,500 ft. Sterile.

Dicranum scoparium (L.) Hedw. Soil at water's edge, foot of Arapahoe Peak. *Miss Leonard*. This may be a form of *D. Bonjeani* as its habit and habitat suggest, but the leaf apices were slender and very rough.

Oncophorus polycarpus (Hedw.) Brid. Crevices in rocks and ledges in rather dry places about Tolland.

O. virens (Sw.) Brid. On logs. *Miss Leonard*, No. 77. Very small, scarcely one-half inch in height.

O. virens serratum (B. & S.) Limpr. Gravelly bank of brook near Tolland.

Swartzia montana (Lamk.) Lindb. On soil. *Miss Leonard*. No. 72.

GRIMMIACEAE

Grimmia apocarpa (L.) Hedw. On soil by road to Teller Lake.

Grimmia apocarpa var. *rivularis* (Brid.) W. & M. On ledge near trestle, and by road to saw mill, Tolland. Frequent.

G. californica Sulliv. Two collections near Tolland. Det. Holzinger.

G. calyptrata Hook. On rocks near Tolland.

G. commutata Hueben. Rocks, Corona. 11-12,000 ft. *Miss Leonard*. Det. Holzinger.

G. Doniana Smith. On rock and ledge along Jenny Creek and by road to Rollinsville, near Tolland.

G. montana B. & S. On ledges and stones. Two localities near Tolland, and at Corona.

G. ovata W. & M. On ledges. Two localities near Tolland. Det. Holzinger.

G. trichophylla Grev. On soil, Corona, Alt. 11,500 ft.

Hedwigia albicans (Web.) Lindb. Ledge by roadside near Rollinsville.

TORTULACEAE

Barbula jallax Hedw. Corona, Alt. 11,500 ft. Det. Holzinger.

Desmatodon latifolius (Hedw.) B. & S. Edge of water at foot of Arapahoe Peak. *Miss Leonard*.

D. latifolius muticus Brid. Outlet of Corona Lake, Alt. 11,000 ft. Gemmae present. This is the var. *glacialis* of the L. & J. Manual. Det. Holzinger. "The leaves in this plant are not spatulate nor ligulate as described for *Tortula latifolia* . . . they are rather narrowed from a little below the apex, becoming finally abruptly apiculate. It is clearly monoicous while *T. latifolia* is dioicous.

and its male flowers have not been found. The peristome is that of *Desmatodon* and not at all as in *Tortula*; its basilar tube short, of only three horizontally lengthened cells."

Didymodon rigidulus Hedw. On ledges near trestle above Tolland. Det. Holzinger.

D. rubellus (Hoffm.) B. & S. Near Corona Lake, Alt. 11,500 ft. Det. Holzinger. Also by Miss Leonard but no data given.

Tortella tortuosa (L.) Limpr. James Peak. Miss Leonard.

Tortula canescens (Br.) Mont. Shores of Corona Lake. Alt. 11,000 ft. Det. Holzinger.

According to Dixon this species is much like *T. muralis* in all its vegetative parts, but much smaller. The only certain distinction is the long tubular basal membrane forming a tessellated tube almost half the length of the peristome. New to N. America.

Tortula latifolia Bruch. Outlet of Corona Lake, Alt. 11,000 ft. Capsules very short for the genus, either immature or old and without peristome. Gemmae present.

T. mucronifolia Schwaegr. On soil near Tolland. Overholt.

T. ruralis (L.) Ehrh. Common in rather dry places. Occurring at Corona also.

T. subulata (L.) Hedw. Upper end of Boulder Park, Mr. C. J. Young.

T. subulata var. *subinermis* Schimp. Dry rocks near Tolland.

Trichostomum cylidricum (Bruch.) C. M. In crevices of rock near Tolland, with *Encalypta*. Determination doubtful.

ENCALYPTACEAE

Encalypta vulgaris var. *obtusifolia* Funck. Crevices of rock. Frequent, but sparse. Leaves like those of *E. streptocarpa*, but smaller, as is the whole plant.

ORTHOTRICHACEAE

Amphidium lapponicum (Hedw.) Schimp. Near trestle above Tolland. Miss Leonard. On rocks near Tolland.

Orthotrichum alpestre Hornsch. On rocks near Rollinsville. Det. Holzinger.

O. Hallii S. & L. Ledges by road to Rollinsville.

O. Lyellii Hook. & Taylor. On rocks near trestle above Tolland. Det. Holzinger.

O. Schimperii Hamm. Ledges by road to Rollinsville.

O. Schlotthaueri Vent. South peak of Arapahoe. Miss Leonard. Det. R. S. Williams.

O. Shawii Wats. Ledges by road to Rollinsville and near trestle above Tolland.

O. speciosum Nees. Two localities near Tolland. Prof. Holzinger has a suspicion that this may be *O. Kingianum* but says the material is not in shape to decide.

O. speciosum polycarpum Lesq. & James. On north-facing rocks and ledges near Tolland. Two localities. Capsule long-exserted, 8-plicate when old. papillae of leaves 2-3 forked.

O. Watsoni James. Ledges by roadside between Rollinsville and Tolland. Det. Holzinger.

FUNARIACEAE

Funaria hygrometrica (L.) Sibth. Frequent.

TIMMIACEAE

Timmia austriaca Hedw. Moist north-facing cliffs a mile below Tolland.

AULACOMNIACEAE

Aulacomnium palustre Schwaegr. Frequent and abundant but grading into and mixed with

A. palustre imbricatum B. & S. which has some of the upper leaves almost identical at apex with *A. turgidum*. The variety is common in swamps near Tolland and was collected at Eldora Lakes and elsewhere.

BARTRAMIACEAE

Bartramia ithyphylla (Haller) Brid. Moist crevices in cliffs around Tolland. Also at Corona. Infrequent and occurring in small quantities.

Philonotis Muhlenbergii (Schwaegr.) Brid. Springy rivulet near Tolland, also by roadside on the way to Apex, 10,000 ft. Teller Lake, *Miss Leonard*.

P. seriata Mitt. Outlet Corona Lake. Alt. 11,000 ft. Determination doubtful.

BRYACEAE

(*Bryum* was mostly determined by Dr. A. LeRoy Andrews.)

Bryum argenteum L. Teller Lake. Det. Holzinger.

*B. caespiticiu*m L. Frequent.

B. capillare L. Near Corona Lake, 11,000 ft.

B. affine (Bruch) Lindb. Banks of Jenny Lind Creek.

B. Duvalii Voit. Swamp by creek just beyond Baltimore; also around Corona Lake.

B. pendulum (Hornsch.) Schimp. Frequent. Above Corona Lake, at an altitude of over 11,000 ft.

B. pseudo-riquetrum (Hedw.) Schwaegr. Common in the Tolland region. *Miss Leonard* and I made 16 collections.

B. subpurpurascens Kindb. Moist shady crevices Tolland; Corona Lake. Det. Holzinger.

Leptobryum pyriforme (L.) Wils. Frequent.

Mniobryum albicans (Wahlenb.) Limpr. Swamp by Jenny Lind Creek.

Mnium affine rugicum B. & S. Swamp above Eldora Lakes. Determination doubtful.

M. hornum L. Cleft in ledge near trestle above Tolland. Det. Holzinger.

M. marginatum (Dicks.) P. B. Moist slope in coniferous forest near Tolland.

M. orthorrhynchum B. & S. Ledges near Jenny Lind Creek. Two localities near Tolland.

M. punctatum L. Swamp by Jenny Lind Creek.

M. punctatum elatum Schimp. Moist slope by Jenny Lind Creek.

M. rostratum Schrad. Moist N. facing slope below Tolland; outlet Corona Lake. Det. Holzinger.

M. spinulosum B. & S. Soil and logs near saw mill above Tolland, 9,500 ft. *Miss Leonard*.

Pohlia commutata Schimp. Near Tolland, 10,000 ft. Also Arapahoe Peak. *Miss Leonard*. Det. R. S. Williams.

P. cruda (L.) Lindb. Frequent.

P. nutans (Schreb.) Lindb. Frequent.

P. prolifera (Lindb.) Correns. Rotten wood, bank of Jenny Lind Creek.

LESKEACEAE

Leskea nervosa (Schwaegr.) Myrin. Moist north-facing slope below Tolland.

L. Williamsii filamentosa Best. Dry cliffs near Tolland. Det. Best.

Thuidium Blandowii (W. & M.) B. & S. Swamp above Eldora Lakes. Also in "The Park" near Tolland. Only a few plants were found in either locality.

T. paludosum (Sulliv.) Rau and Hervey. North-facing cliffs by Jenny Creek one-half mile north of Tolland.

HYPNACEAE

(Brachythecieae)

Brachythecium acutum (Mitt.) Sulliv., var. Swamp near Teller Lake about two miles west of Tolland. Alt. 9,500 ft. Capsules very small for the species. (*N. Am. Musci Pl.* 447)

B. collinum (Schleich) B. & S. Frequent on wooded slopes around Tolland. (*N. Am. Musci Pl.* 448)

B. digastrum C. M. & Kindb. Outlet of Corona Lake, alt. 11,000 ft. A peculiar subaquatic form but with the characteristic leaf structure of this species; also at Lily Pond, 10,000 ft.

B. glareosum B. & S. On soil in a coniferous forest near Tolland. Differs from *B. salebrosum* in being dioicous and in the large leaves with a longer, more slender and twisted acumination. The leaves are also more plicate and rather less serrate. In gross appearance this somewhat resembles *Camptothecium lutescens* from which it differs in the more numerous and larger quadrate alar cells of the more slenderly acuminate leaves. The Colorado specimens are darker than is typical. They are the first American specimens that I have seen that I could refer to this species. Those collected by Macoun and Brinkman are *B. salebrosum*, to my mind.

B. Leibergii Grout. Banks of streams and in swampy places around Tolland. Frequent.

B. Nelsoni Grout. Common on humus, dead wood, and earth in wet places around Tolland, largely taking the place of *B. rivulare*. (*N. Am. Musci Pl.* 450.)

B. oxycladon (Brid.) J. & S. Outlet of Corona Lake, 11,000 ft.

B. oxycladon dentatum (L. & J.) Grout. Around Corona Lake.

B. plumosum (Sw.) B. & S., forma. On soil in moist cool woods near Tolland and in swamp above Eldora Lakes. (*N. Am. Musci Pl.* 449)

B. rivulare B. & S. Occasional in wet places about Tolland. A peculiar variety growing in pool by a creek has been issued as *N. Am. Musci Pl.* 441.

Bryhnia novae-angliae (S. & L.) Grout. Swamp above Eldora Lakes, 9,500 ft. A lax form.

Camptothecium nitens (Schreb.) Schimp. Park Lake swamp.

Eurhynchium diversifolium (Schleich) B. & S. Base of "Tenderfoot." Also about a mile west of Tolland at 10,000 ft. and at Lily Lake.

E. fallax (R. & C.) Grout. Swamp above Eldora Lakes and moist slope a mile below Tolland.

(Climaceae)

Climacium americanum Brid. Park Lake swamp. Approaches *C. Kindbergii*.

C. dendroides (L.) W. & M. Swamps about Tolland.

(Amblystegieae)

Amblystegium Juratzkanum Schimp. Under alders, Mammoth Gulch. *Miss Leonard*. (No. 25). Approaches *A. Kochii*.

A. Kochii B. & S. Mammoth Gulch. *Miss Leonard*. (No. 28.)

A. serpens (L.) B. & S. Common in moist places.

Drepanocladus aduncus (Hedw.) Warnst. Park Lake swamp; swamp above Eldora Lakes.

D. aduncus pseudofluitans (Sanio). n. comb. Sluggish creek below Tolland. *N. Am. Musci Pl.* 459.

D. capillifolius Warnst. Park Lake swamp. (*N. Am. Musci Pl.* 445.)

D. exannulatus (Guemb.) Warnst. Park Lake Swamp. (*N. Am. Musci Pl.* 444.)

D. fluitans (L.) Warnst. (Gr. typicus.) Around Corona Lake, 11,000 ft.

D. Kneiffii (B. & S.) Warnst. Sluggish creek near Tolland.

D. Kneiffii intermedius (B. & S.) n. comb. Swamp near Tolland. (*N. Am. Musci Pl.* 461.)

D. revolvens (Sw.) Warnst. Around Corona Lake, 11,000 ft.

D. Sendtneri (Sch.) Warnst., var. Park Lake swamp. (*N. Am. Musci Pl.* 439.) A puzzling form that might possibly be referred to a form of *D. Wilsoni*.

D. uncinatus (Hedw.) Warnst. Common and variable. Forms very near var. *plumosus* (Sch.) were found.

(Hypneae)

Amblystegiella adnata (Hedw.) Nichols. By roadside between Tolland and Rollinsville.

Hygrohypnum dilatatum (Wils.) Loeske. On submerged stones, outlet Corona Lake, 11,000 ft. (*N. Am. Musci Pl.* 446.)

H. molle (Dicks.) Broth. On stones in brook, outlet Corona Lake. From the same locality as the preceding, of which it may be a large form. (*N. Am. Musci Pl.* 442.)

H. ochraceum (Turn.) Loeske. Frequent in creeks. Outlet Corona Lake, 11,000 ft.

H. palustre (Huds.) Loeske. On stones in creek near trestle just above Tolland.

Hypnum hamulosum B. & S. Around Corona Lake, 11,000 ft. The specimens were sterile and difficult of determination. Dr. Best finds the plants without paraphyllia and thinks they probably belong to this species. To this species also was referred a more slender moss collected near the trestle above Tolland.

H. pallescens (Hedw.) B. & S. On soil. Lily Lake; by road to Teller Lake.

H. patientiae Lindb., forma. Park Lake Swamp. With the appearance of *H. pratense*. (*N. Am. Musci Pl.* 443.)

H. revolutum (Mitt.) Lindb. Common on earth and stones from 8,000–11,000 ft. and exceedingly variable. A very small form scarcely second is referred by Dr. Best to var. *pygmaeum* Mol. This species is the *H. plicatile* of the L. & J. Manual.

Plagiothecium denticulatum (L.) B. & S. Moist soil. Lily Pond. Swamp above Eldora Lakes, near Tolland. The capsules of the Tolland specimens were strongly striate.

(Entodontae)

Entodon orthocarpus (LaPyl.) Lindb. Summit of James Peak, 1,300 ft. *Miss Leonard*.

NECKERACEAE

Neckera pennata (L.) Hedw. Moist ledges near trestle above Tolland.

FONTINALACEAE

Fontinalis antipyretica L. Sluggish creek just below Tolland.

Practically all of the *Tortulaceae*, *Grimmiaceae*, and *Orthotrichaceae* have been examined by Prof. J. M. Holzinger, but too late to give credit for individual species.

A few hepatics were collected. These have been reported on by Dr. Evans in the BRYOLOGIST for May, 1915. Since that report I have discovered *Chiloscyphus pallescens* (Ehrh.) Dum. among my mosses. All my hepatics are with Dr. Evans.

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